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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/664,950	09/22/2003	James T. Yeh	S-99117	5724

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UNITED STATES DEPARTMENT OF ENERGY
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ATTN: GC-62 (CHI), MS 6F-067
WASHINGTON, DC 20585-0162

EXAMINER	
NGUYEN, NGOC YEN M	
ART UNIT	**PAPER NUMBER**
1754	

DATE MAILED: 05/04/2006

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary	Application No.	Applicant(s)	
	10/664,950	YEH ET AL.	
	Examiner	Art Unit	
	Ngoc-Yen M. Nguyen	1754	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on *17 February 2006*.

2a)☒ This action is **FINAL**. 2b)☐ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) *1-20* is/are pending in the application.

4a) Of the above claim(s) *10-17* is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) *1-9, 18-20* is/are rejected.

7)☐ Claim(s) _____ is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☐ The specification is objected to by the Examiner.

10)☐ The drawing(s) filed on _____ is/are: a)☐ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

12)☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☐ All b)☐ Some * c)☐ None of:

1.☐ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1) ☒ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☐ Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08) Paper No(s)/Mail Date _____.
4) ☐ Interview Summary (PTO-413) Paper No(s)/Mail Date. _____ .
5) ☐ Notice of Informal Patent Application (PTO-152)
6) ☐ Other: _____.

DETAILED ACTION

The following is a quotation of the first paragraph of 35 U.S.C. 112:

> The specification shall contain a written description of the invention, and of the manner and process of making and using it, in such full, clear, concise, and exact terms as to enable any person skilled in the art to which it pertains, or with which it is most nearly connected, to make and use the same and shall set forth the best mode contemplated by the inventor of carrying out his invention.

Claims 18-20 are rejected under 35 U.S.C. 112, first paragraph, because the specification, while being enabling for oxidizing the acid anhydrides precursors when the acid anhydrides precursors are NO_x, SO_x, does not reasonably provide enablement for oxidizing CO_2. The specification does not enable any person skilled in the art to which it pertains, or with which it is most nearly connected, to use the invention commensurate in scope with these claims. In claims 18 and 19, the claimed acid anhydrides precursors are selected from a group consisting of NO_x, SO_x, and CO_2, however, CO_2 cannot be oxidized as required in the instant independent claims 1 and 19.

The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

Claims 1-9, 18 are rejected under 35 U.S.C. 103(a) as being unpatentable over Izutsu et al (6,355,084) in view of Hammer et al (6,759,022) and the admitted prior art on page 4, paragraph [0013].

Izutsu '084 discloses a process for producing a fertilizer from gas containing sulfur dioxides, comprising:

injecting ammonia into said gas;

irradiating said gas with an electron beam; and

collecting a product (note claim 1).

Izutsu '084 discloses that the flue gas can be for example fossil fuel combustion flue gas (note column 1, lines 48-55).

SO_2 which is a primary component of sulfur oxides contained in fossil fuel combustion flue gas or the like, is oxidized very quickly into SO_3 by active components including O radicals, OH radicals and the like generated from oxygen molecules or water molecules in the gas when irradiated with the electron beam. This SO_3 reacts with ammonia to produce sulfamic acid or with water to produce sulfuric acid (note column 1, line 62 to column 2, line 14).

Izutsu '084 further discloses that flue gas also contains nitrogen oxides and the flue gas is cooled to 150°C by a heat exchanger, then cooled to 60°C by a water spray cooling tower (note column 8, lines 47-67). The water spray cooling tower would inherently remove any particulate matter from the flue gases.

The differences are Izutsu '084 does not disclose that (1) the nitrogen oxides are also oxidized by the electron beam and (2) the flue gas contains other acid moieties beside sulfur oxides and nitrogen oxides.

For (1), the admitted prior art on page 4 (paragraph [0013]) is applied to teach that the flue gas-ammonia mixture is subjected to beams of high energy electrons, the nitrogen oxides are also oxidized, same as sulfur oxides.

It would have been obvious to one of ordinary skill in the art at the time the invention was made to reasonably expect that the nitrogen oxides in the flue gas of Izutsu '084 to also be oxidized by the electron beam as evidenced by the admitted prior art (paragraph [0013]).

For (2), Hammer '022 teaches that the conventional flue gas obtained from burning fossil fuels contains acidic gases, such as sulfur dioxide, hydrogen chloride and/or hydrogen fluoride, as well as particulate matter and nitrogen oxide (note column 3, lines 5-13).

It would have been obvious to one of ordinary skill in the art at the time the invention was made to use the process of Izutsu '084 to remove sulfur oxides and nitrogen oxides from a flue gas containing hydrogen chloride and hydrogen fluoride in addition to the above mentioned oxides because Hammer '022 teaches that these acid gas contaminants are conventional in the art and removal of the oxides is desired.

Claims 1-9, 18-20 are rejected under 35 U.S.C. 103(a) as being unpatentable over Mimura et al (5,648,053) in view of Izutsu '084 and Gal (5,624,649) and optionally further in view of Slavid et al (2002/0058164).

Mimura '053 discloses a process for removing carbon dioxide and nitrogen oxides from combustion gases (note title).

As shown in Figure 1, the process treating a combustion gas comprises the steps of cooling and dedusting the combustion gas from a boiler (note column 2, lines 22-25); adding ozone to oxidize the NO to NO_2 (note column 2, lines 32-35), desulfurizing the resulting gas and then removing CO_2 along with any NO_2 (note column 3, lines 19-24).

The combustion gas in Mimura '053 is a gas coming out of boilers of thermal power plants that burn much fossil fuels (note column 1, lines 26-29).

The difference are Mimura '053 does not disclose (1) the detail for the desulfurizing step and (2) the simultaneous removal of other acid gases such as HCl or HF.

For difference (1), Izutsu '084, as applied above, teaches that it is desirable to oxidize the sulfur dioxide to SO_3 (note column 1, lines 62-65) before removing the SO_3.

Izutsu '084 further teaches that the SO_3 can be removed by reacting it with ammonia and water to form sulfamic acid and sulfuric acid (note column 1, line 67 to column 2, line, 14).

It would have been obvious to one of ordinary skill in the art at the time the invention was made to use a process, as suggested by Izutsu '084, to first converting SO_2 to SO_3 and then removal the SO_3 by contacting it with ammonia and water, as the

desulfurization process in the process of Mimura '053 because such desulfurization process is known and conventional in the art.

Optionally, Slavid '164 can be applied to teach that sulfur dioxide is readily oxidized by ozone (note paragraph [0003]).

For difference (2), Gal '649 discloses a process for reduction of sulfur dioxide emission from combustion gases (note claim 1).

Gal '649 further discloses that combustion of fossil fuels produce exhaust gases, which contain sulfur dioxide, and other acidic gases (note column 1, lines 15-25). In the process of Gal '649, a reaction occurs during the scrubbing operation between the free ammonia and sulfur dioxide and if hydrogen chloride and/or hydrogen fluoride are present in the flue gas, as is the case with flue gas produced by the combustion of coal, these acidic gases are also captured to form ammonium chloride and ammonium fluoride (note column 4, lines 44-51).

Gal '649 can be further applied to teach the step of recovering ammonia after the desulfurization step (note Figure 1).

It would have been obvious to one of ordinary skill in the art at the time the invention was made to use the process of Mimura '053 to remove CO_2, NO_x, SO_x from a combustion gas containing HF and HCl in addition to the above mentioned oxides because Gal '649 teaches that these acid gas contaminants are conventional for a combustion gas generated when fossil fuel is combusted and these acid gas contaminants are simultaneously removed along with the SO_x when the combustion gas is contacted with ammonia.

Applicant's arguments filed February 17, 2006 have been fully considered but they are not persuasive.

Applicants argue that Izutsu '084 does not teach the simultaneous conversion of acid anhydrides and acid moieties.

Granted that Izutsu '084 does not specifically disclose the simultaneous conversion of acid anhydrides and acid moieties, however, in Izutsu '084, the step of converting acid anhydrides to ammonia compound would inherently convert any acid moieties contained in the combustion gas. It should be noted that as stated in the above rejection, Hammer is applied to teach that combustion gas, obtained from burning fossil fuel, would contain hydrogen chloride and/or hydrogen fluoride in addition to sulfur dioxide and nitrogen oxide (note Hammer '022, column 3, lines 5-13).

Applicants argue that Hammer '022 does not teach the simultaneous conversion of acid anhydride precursors and acid moieties.

Hammer '022 is not relied upon to teach the conversion of acid anhydride precursors and acid moieties. Hammer '022 is applied to teach that the presence of acid moieties such as HCl and/or HF in the combustion gases obtained from burning fossil fuel is known and conventional in the art.

New ground of rejection is applied as stated above to specifically teach the simultaneous conversion of sulfur oxide and HCl, HF and the step of removing CO_2.

Applicant's amendment necessitated the new ground(s) of rejection presented in this Office action. Accordingly, **THIS ACTION IS MADE FINAL**. See MPEP

§ 706.07(a). Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).

A shortened statutory period for reply to this final action is set to expire THREE MONTHS from the mailing date of this action. In the event a first reply is filed within TWO MONTHS of the mailing date of this final action and the advisory action is not mailed until after the end of the THREE-MONTH shortened statutory period, then the shortened statutory period will expire on the date the advisory action is mailed, and any extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of the advisory action. In no event, however, will the statutory period for reply expire later than SIX MONTHS from the date of this final action.

The prior art made of record and not relied upon is considered pertinent to applicant's disclosure.

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Ngoc-Yen M. Nguyen whose telephone number is (571) 272-1356. The examiner is currently on Part time schedule.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Mr. Stanley Silverman can be reached on (571) 272-1358. The fax phone numbers for the organization where this application or proceeding is assigned are (703) 872-9306 or (571) 273-8300.

Any inquiry of a general nature or relating to the status of this application or proceeding should be directed (571) 272-1700.

Ngoc-Yen M. Nguyen
Primary Examiner
Art Unit 1754

nmn
April 30, 2006